

## PATENT COOPERATION TREATY



PCT

REC'D 20 DEC 2005

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY PCT

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference AA 1619 PCT	FOR FURTHER ACTION See Form PCT/PEAA416	
International application No. PCT/GB2004/005225	International filing date (day/month/year) 14.12.2004	Priority date (day/month/year) 16.12.2003
International Patent Classification (IPC) or national classification and IPC F01N3/023, F01N3/035, F01N3/28		
Applicant JOHNSON MATTHEY PUBLIC LIMITED COMPANY et al.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 3 sheets, as follows:</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 20px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>		
Date of submission of the demand  14.10.2005	Date of completion of this report  28.11.2005	
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Ikas, G  Telephone No. +49 89 2399-7892 	

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ON PATENTABILITY**

International application No.  
PCT/GB2004/005225

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-10 as originally filed

**Claims, Numbers**

1-20 filed with telefax on 14.10.2005

**Drawings, Sheets**

1/2, 2/2 received on 10.02.2005 with letter of 10.02.2005

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-20
	No: Claims	
Inventive step (IS)	Yes: Claims	1-20
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

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**Re Item I**

Reference is made to the following documents (D1, D2):

D1: US 4,449,362 A

D2: US 5,103,641 A

**Re Item V**

Document D1, which is considered to represent the most relevant state of the art, discloses an exhaust system comprising a particulate filter (21) and deflector (14) in the shape of a frusto-cone, from which the subject-matter of independent claim 1 differs in that the deflector comprises a flow through substrate comprising at least two channels which are parallel to one another.

The subject-matter of independent claim 1 is therefore novel (Article 33(2) PCT).

Said additional features of claim 1 are neither known from, nor rendered obvious by, the available prior art. Furthermore, none of the documents cited in the International Search Report teaches the skilled person to amend the deflector known from the disclosure of D1 as indicated in claim 1.

Thus, it appears that the independent exhaust system of independent claim 1 is not only new but also fulfills the requirement of inventive step (Article 33(3) PCT).

Claims 2 to 19 are dependent on claim 1 and therefore similarly comply with the requirements set forth by Articles 33(2) and 33(3) PCT.

The independent method claim 20 also fulfills the requirements of novelty and inventive step as set forth by Article 33 PCT. The reasons being the same as laid out for independent claim 1 (see above).

The subject-matter of claims 1 to 20 is considered to have an industrial application (Article

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33(4) PCT).

**Re Item VII**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.

The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.

**Re Item VIII**

The references to preceding claims of dependent claims 5, 6, 7, 10, 16, 17 and 19 are wrong.

The embodiment of the invention described on page 5, lines 23 to 30, and shown in figure 3 does not fall within the scope of the claims.

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**CLAIMS:**

1. An exhaust system (10) for a lean burn internal combustion engine, which system comprising a particulate filter (12) disposed between an inlet (18) and an outlet and means for deflecting at least some exhaust gas flowing in the system away from entering the filter at a point immediately opposite the inlet, wherein the deflecting means comprises a deflector (14) disposed on the inlet side of the filter, which deflector comprising an upstream end having a first cross sectional area and a downstream end having a second cross sectional area, wherein the second cross sectional area > the first cross sectional area, and wherein the deflector is in the shape of a cone or a frusto-cone, characterised in that the deflector comprises a flow through substrate comprising at least two channels which are parallel to one another.
2. A system according to claim 1 to 2, wherein the cone or frusto-cone is squashed in at least one dimension about a central, longitudinal axis.
3. A system according to any of claims 1 to 3, wherein the deflector is made of a metal.
4. A system according to any preceding claim, wherein the deflector comprises a catalyst.
5. A system according to claim 5, wherein the catalyst is for oxidising NO in the exhaust gas to NO<sub>2</sub>.
6. A system according to claim 5 or 6, wherein the catalyst comprises an optionally supported at least one platinum group metal (PGM).
7. A system according to claim 7, wherein the PGM comprises platinum.

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8. An exhaust system according to any preceding claim, wherein the deflecting means comprises a lateral washcoat gradient on the filter, whereby the backpressure in a region of the filter immediately opposite the inlet  $>$  backpressure in an area peripheral to said region.

9. An exhaust system according to any preceding claim, wherein the deflecting means comprises lateral gradient of catalyst loading on the filter, whereby the catalyst loading in a region of the filter immediately opposite the inlet  $<$  catalyst loading in an area peripheral to said region.

10. An exhaust system according to claim 10, wherein the catalyst comprises at least one PGM, optionally platinum.

11. A system according to any preceding claim, wherein the inlet is immediately opposite the centre of the filter.

12. A system according to any preceding claim, wherein the filter is a wall-flow filter.

13. A system according to any preceding claim, wherein the filter is of non-circular cross-section.

14. A system according to any preceding claim, wherein the shape of the deflector in cross-section is the same as, or similar to, the shape of filter in cross-section.

15. A system according to any preceding claim, wherein the filter comprises a catalyst.

16. A system according to claim 23, wherein the catalyst comprises an optionally supported at least one PGM.

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17. A system according to claim 24, wherein the PGM includes platinum.
18. An internal combustion engine including an exhaust system according to any preceding claim.
19. An engine according to claim 26, wherein it is a diesel engine.
20. A method of more evenly distributing particulate matter in a flowing exhaust gas across a particulate filter disposed in an exhaust system, which method comprising deflecting at least some exhaust gas flowing in the system away from entering the filter at a point immediately opposite an inlet wherein the deflecting means comprises a deflector disposed on the inlet side of the filter, which deflector comprising an upstream end having a first cross sectional area and a downstream end having a second cross sectional area, wherein the second cross sectional area  $>$  the first cross sectional area, and wherein the deflector is in the shape of a cone or a frusto-cone, characterised in that the deflector comprises a flow through substrate comprising at least two channels which are parallel to one another.

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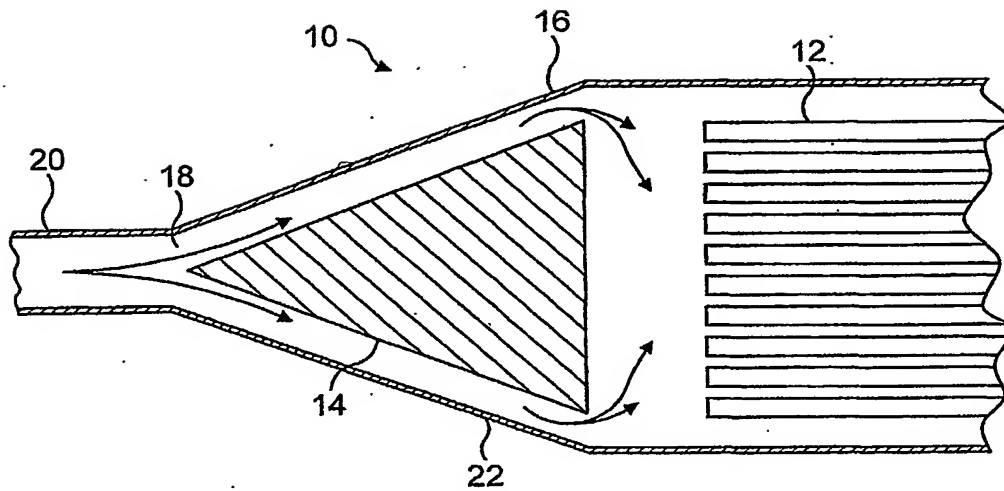


FIG. 1

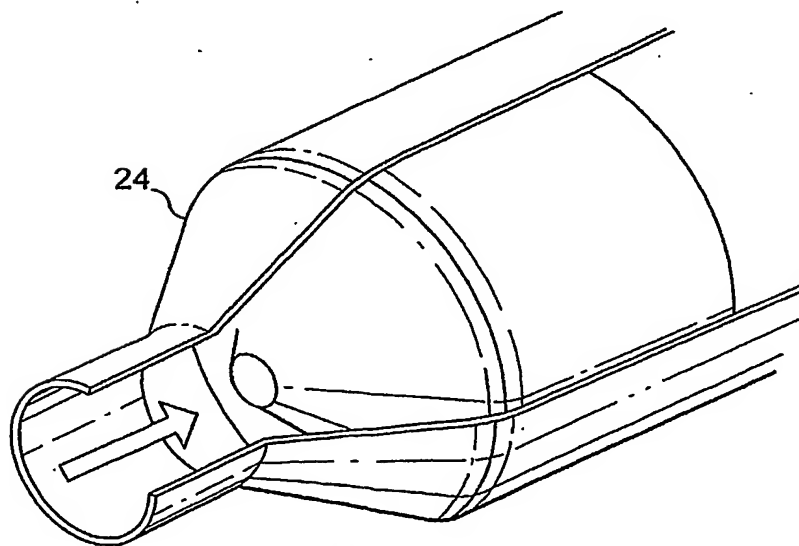


FIG. 2A

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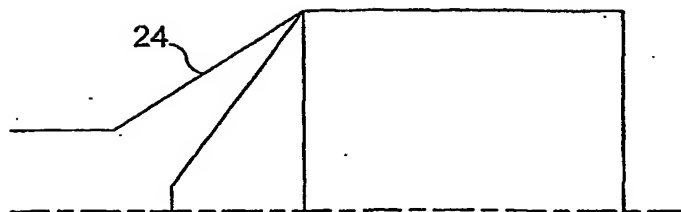


FIG. 2B

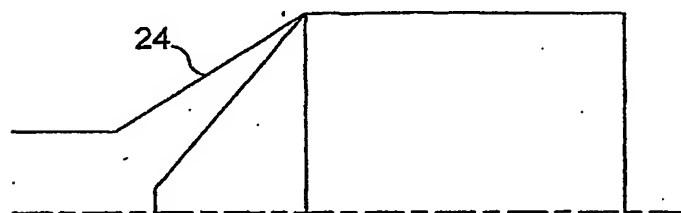


FIG. 2C

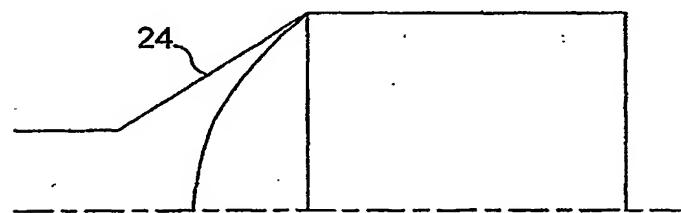


FIG. 2D

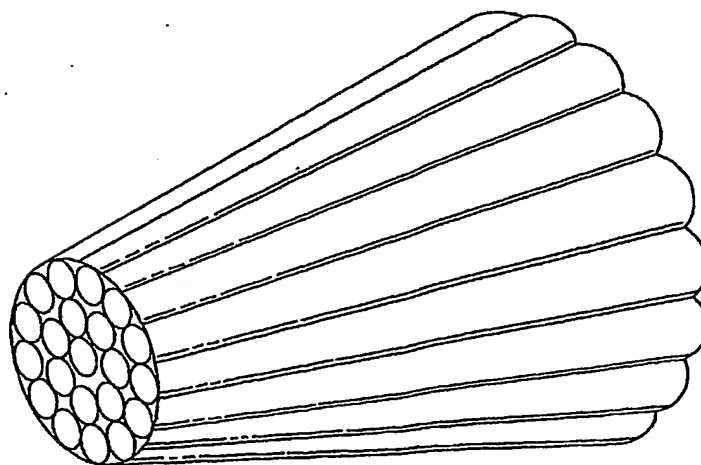


FIG. 3